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# A PORTABLE SCALE FOR COTTON TRAILERS

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# A PORTABLE SCALE FOR COTTON TRAILERS

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In cotton production research to properly evaluate new ideas and techniques, the yield should be measured from a series of plots. Yields from small plots can be measured by either sacking the cotton inside the picker basket or by using a sacking attachment such as described by Clayton, Holston, and Wooten.<sup>2</sup> These methods work satisfactorily when the plot yield is 50 pounds or less.

Large field plots are sometimes necessary to properly measure the reaction of cotton yield and fiber properties to different growing and harvesting techniques. The large plots are usually required in comparing or evaluating the wide multiple-row machines now in use. Generally, the weights from large plots are obtained by weighing the cotton in a separate container and transferring it to a trailer.

Both platform and individual portable wheel scales have been used by researchers at the Delta Branch Experiment Station, Stoneville, Miss. to weigh large lots of cotton in a trailer. The platform scale, which is similar to those used at most gins, may already be available to the researcher. However, the necessity of transporting the trailer to the scale after each plot is harvested is time consuming and can cause expensive delays in harvesting.

The individual wheel scales offer the advantages of portability, but each scale must be read and the weights totaled, causing some inconvenience. Both methods are inaccurate for small- or medium-sized plots. Platform scales

usually are graduated in 20-pound increments and the individual wheel scales are graduated in 5-pound increments, giving an error of 10 to 20 percent for weights of 100 to 200 pounds.

Carter, Colwick, and Little<sup>3</sup> developed a portable seed cotton scale trailer that is much more accurate and convenient for weighing medium- to large-sized plots than the two methods previously described. Cotton is dumped into the seed cotton scale trailer, weighed, and then dumped into a cotton trailer. Hydraulic cylinders are used to lift and dump the weighing basket.

The portable trailer scale described in this publication was designed to weigh to the nearest pound and to handle accurately and conveniently plots weighing 100 pounds or more. Criteria considered in designing the scale were portability, one-man operation, self-containment, high capacity, minimum height, accuracy, convenient readout, and repeatability.

## DESCRIPTION AND CONSTRUCTION

The portable scale consists of four major components: (1) Main frame; (2) weighing platform; (3) weighing mechanism; and (4) hydraulics (fig. 1). The scale is 20 feet long, excluding the tongue, and 9 feet wide; it weighs approximately 3,000 pounds.

The scale was constructed almost entirely of steel channel as follows: 10-inch channel on the sides, 7-inch channel on the ends, 6-inch channel for the center cross members, and 12-inch channel for the cotton trailer wheel runners. The actual weighing platform, consisting of two pieces of 12-inch channel rigidly connected, is not connected in any way to the main frame of the scale. It is held in position with eight small wheels, which allows

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<sup>2</sup> Clayton, J. R., Holston, J. T., and Wooten, O. B. Two Mechanical-Picker Attachments for Harvesting Cotton Research Plots. U. S. Dept. Agr., Agr. Res. Serv. ARS 42-90, 11 pp. Oct. 1963.

<sup>3</sup> Carter, L. M., Colwick, R. F., and Little, D. E. A Portable Seed Cotton Scale Trailer for Research Plots. U. S. Dept. Agr. Res. Serv. ARS 42-63, 8 pp. February 1962.



Figure 1. Side view of the portable trailer scale in the raised or transport position.

the unit to "float" on the load cells during the weighing operation. Construction details are shown in figures 2, 3, and 4.

Four load cells with a combined capacity of 12,000 pounds are used as the detectors for the weighing mechanism. The four load cells are connected with rigid electrical conduit to a summing junction box that combines the individual signals. The junction box is equipped with a 7-pin connector that allows quick connection to a digital strain gage readout. Forces as small as one pound can be detected. A series of cam-type load supports are used to raise the weighing platform off the load cells during the loading, unloading, and the transporting phases of the operation.

A self-contained hydraulic system is used to raise and lower the transport wheels and to operate the cam-type load supports. The hydraulic system consists of a battery powered pump, oil reservoir, control valves, a hydraulic cylinder for each wheel, and a hydraulic cylinder to operate the cam-type load supports for the weighing platform.

The scale is completely self-contained, except for the digital readout and its accompanying inverter. The unit offers the following operational advantages to the researcher:

- The scale can be operated by one person.
- The scale is completely portable.
- The low overall height of the platform (7 inches above the ground when the wheels are raised) allows cotton to be dumped into a trailer while it is on the scale.
- The unit is very accurate and has very good repeatability except on windy days.

## OPERATION

To obtain maximum utilization of the portable scale, an approximately level site should be chosen near the field to be harvested. The scale is then towed to this site in the raised position and disconnected from the towing vehicle. After the scale is lowered to the ground (fig.5), it is leveled with a hydraulic jack at each corner. The digital readout is then connected to the junction box and a power source. (A 12-volt battery and an inverter are used in this instance.)

The scale is now ready for the cotton trailer (fig. 6). The trailer is scotched, and the weighing platform is lowered onto the load cells by the hydraulically operated cam-type lift. After the trailer tare weight is recorded, the unit is then ready for its first load (fig. 7).

Approximately 15 minutes are required from the time the weighing site is selected until the unit is ready for its first load. After the scale is set up, there is usually no delay required between dumps. Cotton can be dumped into the trailer while it is on the load cells as long as the "shock load" does not exceed 12,000 pounds.

## SUMMARY

A portable scale was designed for weighing trailers. Utilizing load cells, the device which weighs harvested material from research plots weighing 100 pounds or more to the nearest pound, can be operated by one person. Its low profile permits parking a trailer on it and dumping harvested material into the trailer by the harvester. The unit is accurate and has good repeatability.



Technical drawing of a mobile laboratory chassis, showing top and side views with dimensions and component labels.

**Top View Labels:**

- 7" CHANNEL
- 5" TUBE AXLE
- 9" CHANNEL
- 12" CHANNEL
- LOAD CELL
- HYD. CYL.
- CAM CONNECTING RODS
- CONTROL VALVE
- LOAD POSITIONING WHEELS
- ELECTRICAL JUNCTION BOX
- HYDRAULIC PUMP
- 9 ATT
- 9 ATT
- LEVELING SUPPORTS

**Dimensions (Top View):**

- Overall width: 30"
- Overall length: 20"
- Channel widths: 7", 9", 12"
- Tube axle diameter: 5"
- Load cell width: 1-1/4"
- Hydraulic cylinder width: 1-1/4"
- Control valve width: 4-0"
- Load positioning wheels width: 1-6"
- Electrical junction box width: 1-6"
- Hydraulic pump width: 1-2"
- 9 ATT width: 1-2"
- 9 ATT width: 1-2"
- Leveling supports width: 1-6"
- Load cell height: 2-0"
- Hydraulic cylinder height: 2-10"
- Cam connecting rods height: 2-2"
- Control valve height: 4-0"
- Load positioning wheels height: 1-6"
- Electrical junction box height: 1-6"
- Hydraulic pump height: 1-2"
- 9 ATT height: 1-2"
- 9 ATT height: 1-2"
- Leveling supports height: 1-6"

**Side View Labels:**

- 7" CHANNEL
- 5" TUBE AXLE
- 9" CHANNEL
- 12" CHANNEL
- LOAD CELL
- HYD. CYL.
- CAM CONNECTING RODS
- CONTROL VALVE
- LOAD POSITIONING WHEELS
- ELECTRICAL JUNCTION BOX
- HYDRAULIC PUMP
- 9 ATT
- 9 ATT
- LEVELING SUPPORTS

**Dimensions (Side View):**

- Overall width: 30"
- Overall length: 20"
- Channel widths: 7", 9", 12"
- Tube axle diameter: 5"
- Load cell width: 1-1/4"
- Hydraulic cylinder width: 1-1/4"
- Control valve width: 4-0"
- Load positioning wheels width: 1-6"
- Electrical junction box width: 1-6"
- Hydraulic pump width: 1-2"
- 9 ATT width: 1-2"
- 9 ATT width: 1-2"
- Leveling supports width: 1-6"
- Load cell height: 2-0"
- Hydraulic cylinder height: 2-10"
- Cam connecting rods height: 2-2"
- Control valve height: 4-0"
- Load positioning wheels height: 1-6"
- Electrical junction box height: 1-6"
- Hydraulic pump height: 1-2"
- 9 ATT height: 1-2"
- 9 ATT height: 1-2"
- Leveling supports height: 1-6"

Figure 2. Top view of portable trailer scale.

SIDE VIEW

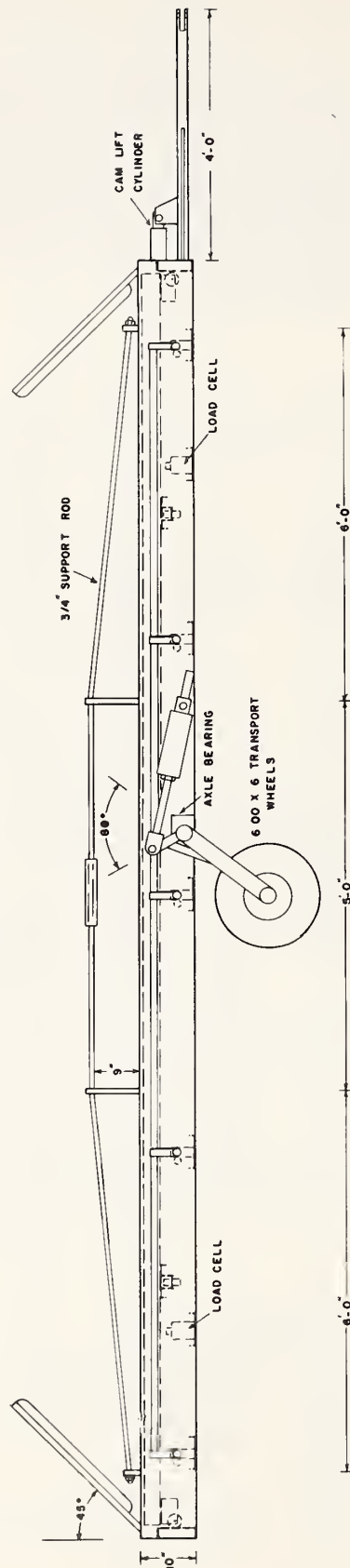


Figure 3. Side view of portable trailer scale.



END VIEW

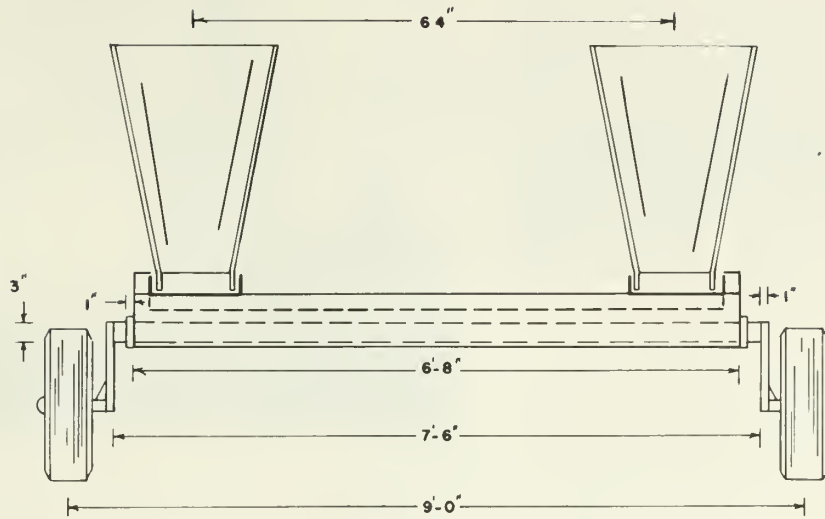


Figure 4. End view of portable trailer scale.



Figure 5. Side view of portable trailer scale after being lowered to the weighing position.



Figure 6. Portable trailer scale with cotton trailer in position for weighing.

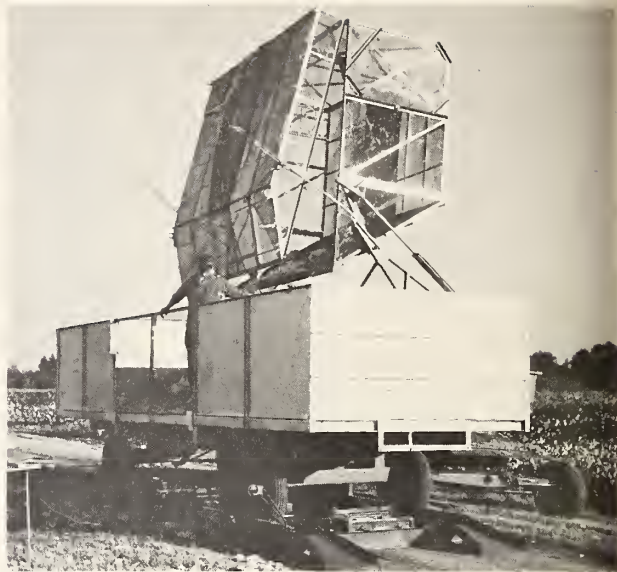


Figure 7. portable trailer scale with cotton trailer in place. The scales are low enough that a picker can dump into the trailer while it is on the scale.